Concretely, the activation energy of temperature dependency of volume resistivity may be adjusted to not higher than 0.4 eV from room temperature to 300 ℃. It is thereby possible to control the volume resistivity within a small range, preferably from 1×10^{13} Ω · cm to 1×10^{8} Ω · cm, in a wide temperature range from room temperature to 300 ℃. It is very important to reduce the temperature dependency of volume resistivity in a field of susceptor or electrostatic chuck described below.

The aluminum nitride sintered body according to the invention may have a higher strength than that of a prior aluminum nitride sintered body with a low volume resistivity. Consequently, the mechanical reliability of the sintered body may be improved. Particularly when a member for producing semiconductors is made of the sintered body according to the invention, it is possible to prevent the falling of particles from the surface of the member, thus improving the yield of the semiconductors.

The samarium-aluminum complex oxide phase may preferably contain $SmAl_{11}O_{18}$ phase and most preferably contain $SmAlO_3$ phase and $SmAl_{11}O_{18}$ phase. The phases may be identified by means of an X-ray diffraction system using conditions described in "Examples" section referring to a phase diagram.

Aluminum nitride grains in the sintered body may preferably have a mean diameter of not lower than 3 μm and not higher than 20 μm.

The inventors have further studied the contents of aluminum oxide and samarium oxide and found the following relationship. That is, the volume resistivity of the sintered body at room temperature may be further reduced, by controlling the molar ratio of a converted content of samarium calculated as

samarium oxide to a calculated content of aluminum oxide (Sm_2O_3 / Al_2O_3) within 0.05 to 0.5. The content of Sm_2O_3 may be calculated by converting the content of samarium element in the sintered body to the content of Sm_2O_3. The content of Al_2O_3 may be calculated by the following steps. First, total content of oxygen atoms in the sintered body is obtained. Second, the content of oxygen in Sm_2O_3 is subtracted from the total content of oxygen to obtain the content of remaining oxygen. The content of Al_2O_3 is calculated under the provision that all the remaining oxygen atoms are bonded with Al atoms to form Al_2O_3 molecules.

Further, (Sm_2O_3 / Al_2O_3) may preferably be not lower than 0.08 and not higher than 0.4.

The lower limit of volume resistivity at room temperature of the inventive sintered body is not particularly limited, and preferably be not lower than 1×10^7 Ω・cm, and more preferably not lower than 1×10^8 Ω・cm.

In the invention, the phase of samarium-aluminum complex oxide may preferably be of network microstructure. The term "network microstructure" means the following condition.

The intergranular layers made of samarium-aluminum complex oxide are formed along the interfaces (intergranular phase) between aluminum nitride grains. The intergranular layers surrounding two adjacent aluminum nitride particles are continuously formed. Such network microstructure may be confirmed by EPMA.

The content of carbon in the aluminum nitride sintered body according to the invention may preferably be not higher than 0.05 weight

percent.

The relative density of the aluminum nitride sintered body may preferably be not lower than 95 percent.

For providing a sintered body suited for applications in which the contamination of impurities is to be highly controlled (such as an application for producing semiconductors), the total content of metal elements excluding aluminum and all the rare earth elements (including samarium) may preferably be not higher than 100 ppm, in some cases. The total content may more preferably be not higher than 50 ppm.

In the aluminum nitride sintered body according to the invention containing a small amount of samarium, some bodies may exhibit color irregularity of red-brown to brown on their surfaces. The changes or deviations of properties corresponding with the color irregularity have not been observed. The color irregularity on the surface may, however, be undesirable from the viewpoint of preference of a customer.

The inventors have found that the volume resistivity of the sintered body may be reduced without the color irregularity on the surface, by adjusting sintering temperature from 1775 to 1825 °C.

It is also possible to give a color of a low lightness (blackish color) to the surface of the aluminum nitride sintered body, by adding one or more transition metal element selected from the group consisting of metal elements belonging to the periodic table IVA, VA, VIA, VIIA and VIIIA. Such color with a low lightness may be useful for reducing the color irregularity on the surface. Although such added transition metal element may be effective for reducing the